

A ROLE FOR LONG LIVED ISOTOPES IN BIOMEDICAL SCIENCES USING ACCELERATOR MASS SPECTROMETRY. John S. Vogel, Kenneth W. Turteltaub, Stewart Freeman, Jeffrey McAninch, and Laura Hainsworth, LLNL, Livermore, CA 94551

Accelerator Mass Spectrometry (AMS) uses mass spectrometric separation and nuclear acceleration to provide identification and quantification of radioisotopes having half-lives between 10 and 10^7 years to attomole sensitivity in sub-milligram samples. AMS is 10^3 to 10^9 times as sensitive as decay counting for these isotopes. Long-lived isotopes provide labels to make stable chemical compounds for assays and long duration *in vivo* studies. Labeled toxins have been traced to protein and DNA adducts at doses equivalent to that in a single cigarette or to metabolites of a single bite of hamburger. Many important trace nutrient or toxic elements have radioisotopes that were unusable prior to AMS. With lifetimes 1000 times longer than human lives, these isotopes may be used to trace physiological chemistry at safely small chemical and radiological doses.

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